Pacific Gas & Electric
Model Energy Communities
Profile #81

Executive Summary

Pacific Gas & Electric's Model Energy Communities (MEC) Pilot program, what has been commonly called "The Delta Project," was a research initiative that not only serves as a model for a new and innovative form of demand-side management, but which also has provided a host of important lessons learned. The project was conceived to test the opportunity to use DSM as a localized least cost resource, thereby deferring the need for the capital expansion of transmission and distribution systems.

The region served by The Delta Project is largely residential (a classic "bedroom community") with some 25,000 homes, the vast majority of which are owned by two-income families that work in San Francisco or Oakland and return home at the end of the day. At that time, and especially when temperatures exceed 105° F, the homeowners concurrently turn on their air conditioners creating a localized spike in demand. While The Delta Project sought to contain this needle peak through energy efficiency measures, a key lesson learned was that load management options, such as appliance cycling in particular, may have provided a more expeditious means of fulfilling the Project's load shape objective.

The Delta Project was not only ambitious in scope and purpose, but also needed to be implemented quickly to fulfill its basic purpose of substation deferral. The Project was implemented in approximately 18 months in a geographically succinct area focused on the proposed Lone Tree substation. It was designed to assess whether DSM could be a cost effective alternative to substation construction; to determine whether intense marketing and direct install program delivery could result in desired levels of savings by triggering high participation and penetration levels; and to assess customer acceptance of such a strategy.

Many rich lessons were learned by PG&E program staff: First and foremost, the project did serve to defer the construction of the Lone Tree substation, although disaggregating the program's effects from other factors such as the depressed new residential construction market and weather patterns was complex. Second, the program succeeded in delivering a host of DSM measures in a short time frame. This, however, was not without difficulty. PG&E also learned an important lesson about the homogeneity of neighborhoods and thus their relative lack of end-use and end-use consumption diversity. Perhaps most importantly, The Delta Project highlights the litany of unanticipated factors that relate to such a program design, knowledge which can now be used to help program designers to develop effective T&D deferral programs in the future.

PACIFIC GAS & ELECTRIC
Model Energy Communities Program

Sector: *Residential, Commercial*

Measures: *CFLs, low-flow shower heads, shell improvements, duct repair, AC tune-up, insulation, sunscreens, downsizing of AC units.*

Mechanism: *The MEC program was designed to determine whether targeted DSM programs focused on a specific planning area could be a cost effective and reliable alternative to capital investment in T&D via reducing local peak loads. The program targeted the Antioch/Brentwood, California area, Northeast of Oakland*

History: *Program services were available from July 1991 through March 1993*

CUMULATIVE PROGRAM DATA (1991-1993)

Energy savings:	*4,322 MWh*
Lifecycle energy savings:	*86.4 GWh*
Peak capacity savings:	*2.3 MW*
Cost:	*$8,898,200*

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. ANNUAL SAVINGS refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. CUMULATIVE SAVINGS represent the savings in a given year for all measures installed to date. LIFECYCLE SAVINGS are calculated by multiplying the annual savings by the assumed average measure lifetime. CAUTION: cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

Pacific Gas & Electric (PG&E) is the nation's largest gas and electric investor-owned utility and served 12.8 million people in 1993. While PG&E's headquarters are located in San Francisco, its 94,000 square mile service territory in Northern and Central California is broken down into 18 divisions to provide service to 4.36 million electric customers and 3.6 million gas customers. Electricity sales represented approximately three-quarters of the company's total operating revenues which totalled over ten billion dollars.[R#1,2]

Electricity sales totaled 75,653 GWh in 1993 and provided the company with $7.1 billion in revenues. Residential customers accounted for 31.9% of sales, the commercial sector accounted for 34.7% of sales, and the industrial sector accounted for 21.8% of sales. The remaining 11.6% of sales were to other types of customers, mainly agricultural accounts. In 1993 PG&E had 3,803,485 residential electric customers, 451,345 commercial customers, 1,237 industrial customers, 90,761 agricultural customers, and 16,586 miscellaneous customers.[R#2]

PG&E 1993 SOURCES OF ELECTRIC ENERGY

Natural Gas	17.8%
Oil	1.3%
Geothermal	6.5%
Nuclear	16.8%
Combustion Turbine	<1%
Hydroelectric	14.4%
Solar and Wind	<1%
PG&E QF Area Purchases	21.3%
PG&E in Area Purchases	5.6%
PG&E Out of Area Purchases	3.1%
Other Control Area Producers	6.1%
Other Control Area Purchases	7.4%

Like many utilities in North America, PG&E has responded quickly to increased competitive forces as well as the economic recession in California that has slowed growth in electricity use. It dramatically cut staff in the past few years. In fact between 1992 and 1993, 3,600 staff were cut, representing 13.5% of the 1992 workforce and resulting in 23,000 employees in 1993. PG&E claims that this reorganization will not only cut costs but will enable the utility a greater degree of flexibility to respond to changes in the industry, with fewer layers of management standing to impede the utility's responses to market challenges. Furthermore, PG&E hopes that is restructuring will promote productivity, by encouraging innovation and better utilizing employees' experience. This will be critical in the years to come as the giant utility works to enhance customer services to retain major customers and maintain shareholder profitability.

PG&E 1993 ELECTRIC STATISTICS

Number of Customers	4,363,414
Number of Employees	23,000
Energy Sales	75,653 GWh
Energy Sales Revenues	$7.089 billion
Summer Peak Demand	19,607 MW
Generating Capacity	21,553 MW
Reserve Margin	10 %
Average Electric Rates	
Residential	11.04 ¢/kWh
Commercial	10.00 ¢/kWh
Industrial	6.47 ¢/kWh
Agricultural	10.30 ¢/kWh

One of PG&E's subsidiaries, PG&E Enterprises, has been busy building and operating unregulated power plants on the East Coast that supply wholesale power to other utilities. U.S. Generating Company, a joint venture with Bechtel Group, Inc. and PG&E, has 11 plants in operation or construction in Florida, New Jersey, Pennsylvania, Massachusetts, and New York that represent more than 1,700 MW of capacity. PG&E is also considering whether to enter the international marketplace with its power plant construction capabilities.

The City of San Francisco, where PG&E's headquarters are located, has a population of 724,000, but the metropolitan "Bay area" is much larger. The local economy is based largely on electrical and machinery manufacturing. The City has an annual average temperature of 56.6° F and has average annual precipitation of 19.71 inches. Typically San Francisco has 3,161 heating degree days and 115 cooling degree days. ■

Utility DSM Overview

DSM OVERVIEW	ANNUAL C&LM EXPENDITURE (x1,000)	ANNUAL ENERGY SAVINGS (GWh)	ANNUAL CAPACITY SAVINGS (MW)	ANNUAL GAS SAVINGS (THERMS MILLIONS)
1976	$21,413	246	64	47
1977	$25,737	249	48	67
1978	$42,245	292	59	50
1979	$67,246	347	175	76
1980	$113,082	375	277	66
1981	$151,093	479	81	87
1982	$133,601	396	63	99
1983	$204,913	476	84	75
1984	$232,788	997	211	59
1985	$256,044	941	110	119
1986	$244,701	1,010	129	140
1987	$121,931	1,091	498	48
1988	$119,708	163	296	12
1989	$129,593	202	97	14
1990	$128,292	288	676	25
1991	$178,767	607	676	32
1992	$201,248	577	682	29
1993	$167,259	584	101	16
Total	$2,539,661	9320	4327	1061

PG&E CURRENT DSM PROGRAMS

Residential

New Construction

Appliance Efficiency Incentives

Weatherization Retrofit Incentives

Direct Assistance

Energy Management Services

Information Programs

Nonresidential

Commercial New Construction

Nonresidential Energy Efficiency Incentive

Commercial Energy Management Services

Industrial Energy Management Services

Agricultural Energy Management Services

Nonresidential Information Programs

Other

Model Energy Communities (MEC)

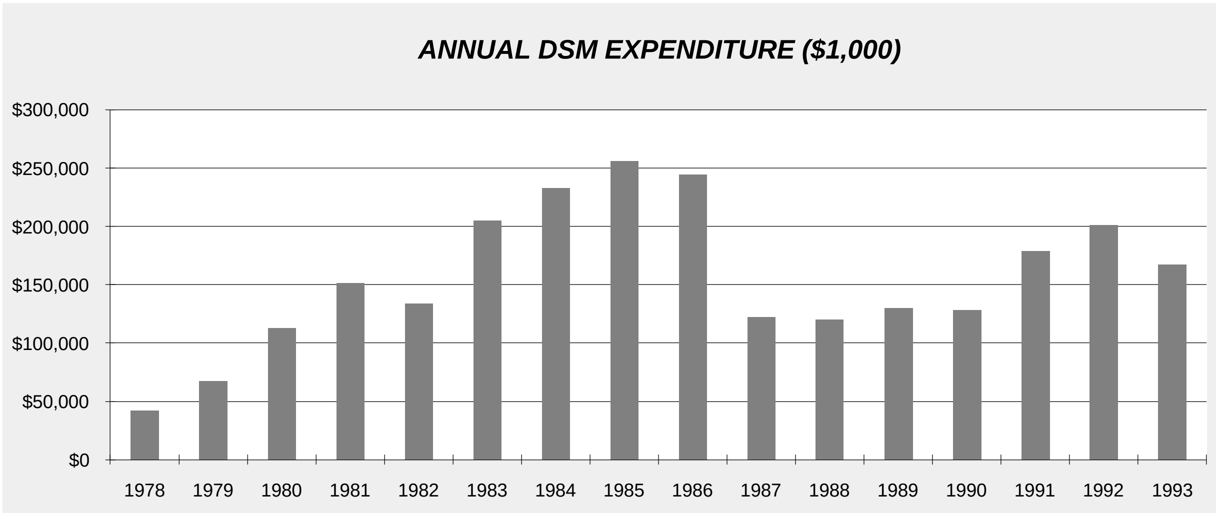
Load Management Programs

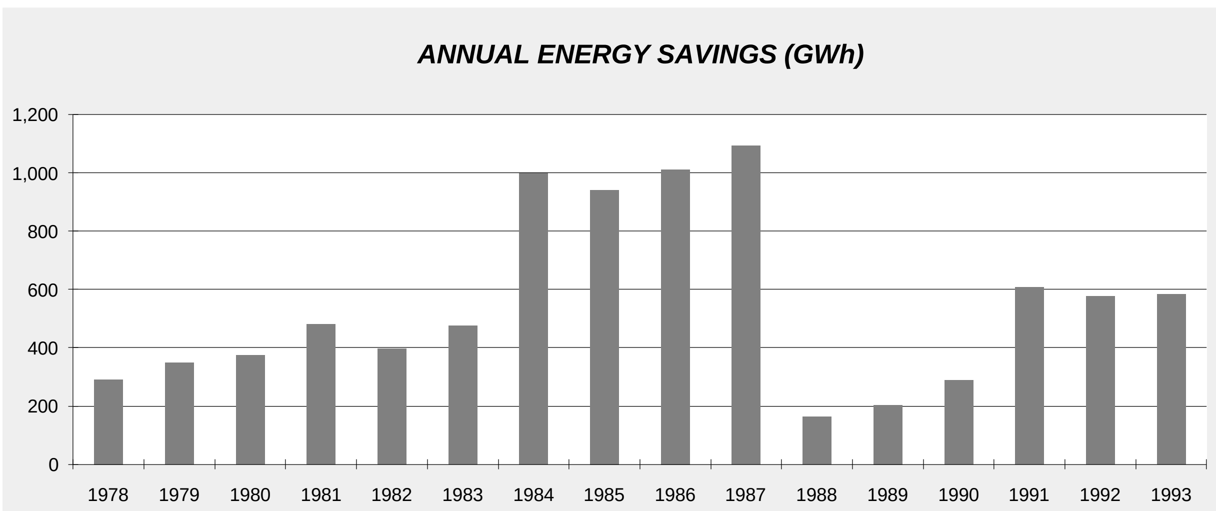
CEE Demonstration Projects

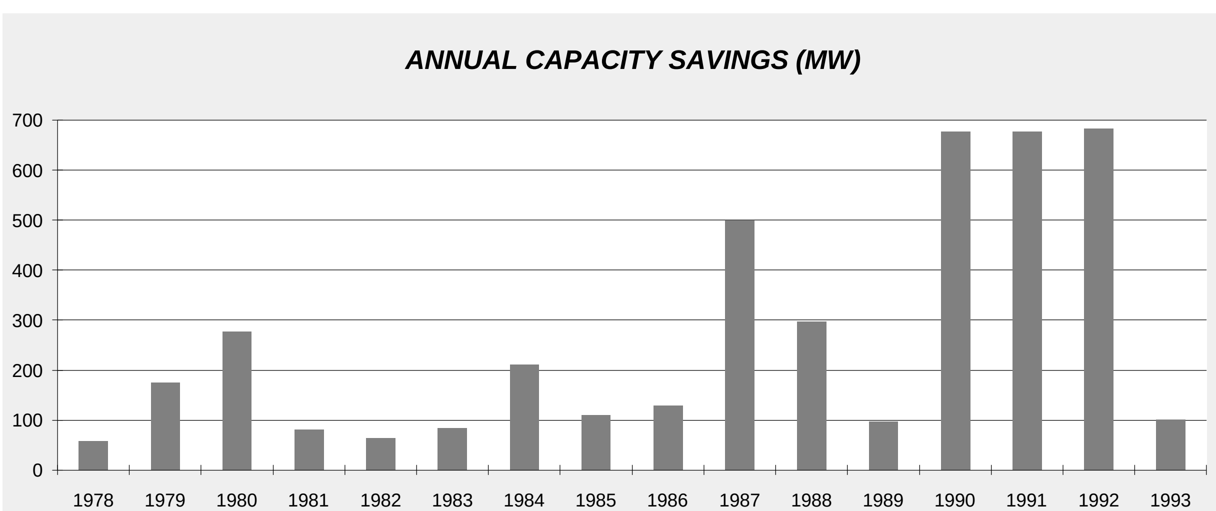
Pacific Gas & Electric has been among the leading U.S. utilities in the field of demand-side management (DSM) since 1976. Over the years the utility has spent more than $2.5 billion on its conservation and load management activities, including a small sum for solar DSM activities. The data presented in this section refers only to conservation and load management and represents both gas and electric expenditures and savings.[R#3,4]

PG&E refers to its conservation efforts as Customer Energy Efficiency (CEE) programs. These programs were significantly expanded in 1990 when the California Public Utilities Commission issued a decision authorizing the utility to implement new energy efficiency programs and enhance existing ones.[R#3,4]

In 1993, DSM program expenditures were equal to 2.4% of the utility's total electric revenues. DSM expenditures for 1993 totaled $167,259,000 while annual energy savings were 584 GWh, peak capacity savings totaled 101 MW, and gas savings reached 16 million therms. Electricity savings were slightly higher than the utility's goal of 578 GWh, however the peak demand reduction and gas savings accomplishments were lower than the goals. Electricity savings from PG&E's 50 DSM programs resulted in savings equivalent to the annual usage of 61,000 PG&E households.[R#3] ■


ANNUAL DSM EXPENDITURE ($1,000)
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993


ANNUAL ENERGY SAVINGS (GWh)
1,200
1,000
800
600
400
200
0
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993


ANNUAL CAPACITY SAVINGS (MW)
700
600
500
400
300
200
100
0
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993

Program Overview

In 1991, PG&E established the Targeted Transmission and Distribution (T&D) DSM Load Deferral Program. The focal point for this effort was the implementation of the Model Energy Communities (MEC) Pilot program. MEC, or what has been popularly referred to as “the Delta Project,” offered service in the field from July 1991 through March 1993. The purpose of the MEC program was threefold: 1) to determine whether targeted DSM programs focused on a specific distribution planning area could be a cost effective and reliable alternative to capital investment in T&D via reducing local peak loads; 2) to determine whether intensive marketing and implementation techniques could garner the desired and necessary high market penetration levels; and 3) to assess the program’s performance and customer acceptance of the selected program delivery mechanisms. [R#5]

Perhaps the most important aspect of the program is that it has set a precedent. The Delta Project was the most aggressive and extensive program of its type implemented to date. In fact, many people consider the area of transmission and distribution (T&D) to be one of the primary new frontiers for the development of DSM, because distribution capital costs account for an ever-increasing share of utilities’ capital costs. (See The Results Center Topical Paper, Community-Based Energy Efficiency Programs and Profiles #5,12,16,43.) [R#3,5,6,7,8,13]

The MEC program was implemented in the Antioch/Brentwood, California area, northeast of Oakland and located in “far eastern” Contra Costa County. This area is referred to as “the Delta” as it borders the Sacramento and San Joaquin Rivers and their deltas at the confluence with San Francisco Bay. The targeted area has a base of approximately 25,000 homes and 3,000 non-residential customers. The geographic program area was defined by the distribution planning area for the proposed Lone Tree substation and consisted of five existing mainline feeders from two substations.[R#9]

Following two years of local integrated resource planning and its associated modeling, PG&E management approved a proposed MEC pilot implementation plan on February 7, 1991. This approval initiated an extremely quick gear-up process lasting six months, with the program providing services to customers by July 1991. Implementation efforts were managed from the MEC program office set up in Brentwood.[R#5]

Although initial plans called for the program to run through 1994, in March 1993 the MEC implementation phase was concluded. The program contributed to the deferral of the proposed Lone Tree Substation for almost two years, based on the load impacts of the program both actual and projected for the coming year. Other factors contributing to deferral included the ongoing recessionary economic factors (which led to a continued slowdown in residential new construction starts) and the project’s inclusion of weather normalization techniques in the distribution planning methodologies.[R#5]

The program was discontinued in the Spring of 1993 because several program goals had been met and the likelihood of construction of a 10 MW base load water pumping station in the Brentwood area became certain. This load will more than offset any savings from the MEC program. Noting its inclusion showed the value of constantly updating the planning process assumptions used for DSM programs. In addition the program’s residential air conditioning component (Residential AC Early Replacement program, called RACER) achieved participation levels that were adequate to evaluate from a production level implementation perspective the load impacts of this program component as well as cost effectiveness. The MEC program had also achieved substantial market saturation in the targeted small and medium commercial sectors.[R#5]

Based upon the targeted area’s specific demographics, PG&E developed intensive marketing and implementation strategies which covered a comprehensive range of residential and commercial energy efficiency programs. These strategies were intended to reduce the local area's load growth by about 6 to 8 MW of annual area-specific peak load over several years, offsetting an annual load growth pattern of about 8%. The goal of deferring the proposed capital investment (the Lone Tree substation construction) would reduce the utility's revenue requirement, thereby benefitting not only program participants but all ratepayers.[R#5]

The MEC program's implementation was unique. Earlier community-based conservation programs such as the Hood River Conservation Project (Profile #12) focused on the maximum conservation potential associated with a selected community. While local area costs and benefits were monitored in those programs, the experimental design did not mandate close scrutiny. Rather the goal of the earlier programs was to determine the maximum conservation impact obtainable. While this information is useful from a system or conservation program planning perspective, it does not translate well into area-specific distribution planning.[R#5]

The MEC program, in contrast, demonstrated in a "real world" environment the integrated planning impacts of targeting energy efficiency on a specific distribution system's capital requirements. The MEC program differed from previous community-based projects in that it: 1) considered the peak capacity constraints of a specific distribution planning area and the associated proposed substation construction, 2) expanded the DSM components offered to include all major market segments in the planning area (including residential and commercial retrofits as well as new construction), and 3) closely evaluated the program process and impact relative to the local area specific peak demand.[R#5]

The MEC program was designed to defer a very specific stream of capital investments. Thus it was critical that the program's success be judged on a level playing field with comparable supply-side options. Most importantly, the criteria for success had to be agreed upon by both DSM evaluation staff and the distribution planning staff. The success criteria agreed upon included: 1) penetration levels for each installed measure, 2) the load reduction achieved by each measure compared with the projected reduction from the Integrated Least Cost Planning (ILCP) process, 3) compatibility of the measure-specific impact evaluation results with the System Control and Data Acquisition (SCADA) data collection system, and 4) the actual costs of the program compared with those budgeted.[R#5]

The short time frame for the MEC program's planning and implementation was driven by the local distribution planner's substation development decision process. The construction lead time of a substation is quite long. Distribution planning decisions regarding the timing and size of load growth in the Brentwood area would become critical in early 1993. In order to defer substation construction the MEC program had to demonstrate its viability well in advance of early 1993.[R#5]

In order to accelerate implementing the program to the maximum degree possible, the program staff decided to press management for approval to utilize change orders to existing contractual agreements for the services needed to develop support systems as well as implement measures. This tactic was viable in large part because in many cases similar services were being offered through other PG&E programs. By using existing contractual arrangements there was no need for Request For Proposals (RFP) development and negotiations, which sped up program implementation by at least four months, although often at a higher cost.[R#5] ■

MARKETING

One of the first steps undertaken by MEC program staff was to involve the community in the project. A local citizen advisory committee was established for the project, made up of 6-12 community leaders (but not politicians) including the head of the Chamber of Commerce, a local newspaper columnist, and a local pharmacist. The purpose of the committee was to act as a sounding board for the initial program design and possible program revisions, as well as perform an adjunct marketing role by "talking up" the program within the community.[R#5,9]

At the onset of the MEC program, the staff sponsored customer focus groups and advisory committee meetings regarding the format and direction of the program's marketing strategy. For instance, the committee was asked who PG&E might team up with to increase customer acceptance. PG&E's initial thought was to emulate Central Maine Power's (CMP) link with the Lions fraternal organization in distributing compact fluorescent bulbs, where the utility used the Lions' excellent public image in the community to promote the program (See Profile #19). The MEC project team instead was pleasantly surprised to hear from the advisory committee that the utility was already considered very credible and did not need a link with any outside agency or group.[R#5]

The initial market penetration goal for the residential sector was to achieve 80% participation among households with central air conditioners. The first marketing strategy consisted of two direct mail approaches. The first approach centered around a large, four-color brochure and package with full details on the program including its economic and technical benefits. Customers were instructed to either call the local project office number provided or send in the return postcard which would trigger a call from the project team.

A smaller package was also test marketed with limited program details. This smaller package described program details, but the marketing hook was entry into a sweepstakes drawing for customers who agreed to receive an MEC in-home energy efficiency audit. Three names would be selected each year, with the winning names receiving $5,000, $3,000, and $1,000 worth of energy efficiency improvements approved by PG&E. In addition, three participants were selected each month to receive $500 worth of energy efficiency improvements.[R#5,9]

These two mailings were to be implemented in three to four staggered mailings. The first two stages were based on random sampling while the remaining stages would have used a targeted approach to specific geo-demographic segments. A total of 2,500 packages were delivered during the initial mailing and achieved a response rate during the first 7 days of less than 6%. Thus the goal of 80% participation seemed impractical and a new approach was taken.[R#5]

The new strategy consisted of mailing a single-page letter on PG&E stationery explaining the facts of the program and inviting customers to call if interested. The letter was signed by the local MEC project manager. A sample of 250 letters was mailed and more than 40% of recipients responded within 10 days; the overall response rate was 60%. Each letter also generated an average of three phone-in referrals, pushing the total response rate to nearly 180%.[R#5]

DELIVERY

In general, the customer incentives for the different MEC programs varied on a customer by customer and even a measure by measure basis. On average, PG&E paid 80% of direct installation project costs for the commercial programs. In the residential sector a complex matrix was used to calculate customer incentives.[R#9]

RESIDENTIAL SECTOR RETROFIT SERVICES

The residential retrofit component was the largest segment of the MEC program and was delivered in several phases. The initial phase focused on testing the marketing, scheduling, and service delivery systems on PG&E employees and retirees residing in the target area. This allowed the project team to make adjustments without risking customer alienation. The next phase involved high volume shell and duct repair marketing and delivery. This effort resulted in more than 2,700 homes receiving duct repairs along with other shell improvements (See Profile #51). These repairs were free if they met the criteria for the various measures, such as the amount of shell leakage, existing R-value of the ceiling insulation, etc. The final phase focused on marketing the Residential Air Conditioning Early Replacement (RACER) component.[R#5]

Within the existing residential sector, air conditioning load was identified as the key factor causing the area peak to occur on summer weekdays between 7:00 and 8:00 pm, significantly different from the historical PG&E system peak of 3:00 to 5:00 pm on summer weekdays. This local peak period was driven by the fact that the customer base is 91% residential, representing 74% of the peak load. In addition, the majority of these residential customers are two-income families with long commutes from the San Francisco/Oakland urban core, bringing them home later in the day. As a result, families coming home to outside temperatures often in the 100°F range would turn on their air conditioning (AC) units once they got home. (The area's residents did limited precooling of their homes due to the cost). Thus the focus of the MEC program was placed on the conservation measures most likely to reduce local area load during those peak hours by retrofitting the residential sector.[R#5]

During 1991, initial on-site visits were made to interested customers by an energy specialist who conducted an energy efficiency survey and installed efficiency devices such as compact fluorescent lamps, low flow shower heads, and water heater blankets. These services were provided at no charge to the customer and were the same as those offered through PG&E's system-wide Energy Savings Plan (ESP) program (an appliance end-use analysis/survey). While it was clear that these measures would have minor impact on the local area peak, ESP provided a way to get a representative into the customer's home to identify which houses had central AC, the true focus of the program. At the time of the initial visit, central AC customers were scheduled for follow-up services, during which they would be checked for duct sealing, AC tune-up, ceiling insulation, and sun screening. In the initial phase of the program these services were provided at no cost to the customer. The energy specialist also provided customer education as well as a bill disaggregation during the initial visit. The level of service offered varied depending on whether customers had central air conditioning. Because air conditioners were the targeted load of the program, utility representatives focused on those customers with AC.[R#6,9]

In order to implement shell and duct integrity improvements on a large scale basis within the targeted area, blower door tests were required. This technology was not very widespread in California and therefore the MEC program had to develop a localized infrastructure to support such testing. PG&E commissioned an engineering firm to design the technical specifications for delivering these services as well as develop a MEC "Residential Retrofit Program Component Policy and Procedure Manual," which outlined the implementation of the Direct Installation and Repair component of the Residential Retrofit program. This manual includes a detailed training system which was implemented during mid-1991 in a series of training sessions held at PG&E's Stockton Training Center.[R#5]

Training sessions were developed for three types of in-house technicians: direct install crew members (who performed the blower door testing as well as associated shell and duct repairs), air conditioning technicians (who were to focus on tuning up central AC units), and gas servicemen (who performed both pre- and post-installation combustion appliance safety tests). Training for the crew members consisted of classroom/laboratory lessons on combustion safety as well as duct and shell leakage repairs, on-site training, and in-the-field training focusing on just one house, with feedback from a trainer. Written tests were administered on the day following all classroom sessions and all technicians were to be certified before they began actual work on the program. The certification process consisted of a written examination, practical field demonstration of skills, and field inspection of unsupervised work. Technicians had to pass all three skill areas.[R#5]

In May 1992 a refocusing of the project's scope took place. The revised scope continued to emphasize capital deferral but increased the emphasis on testing the transferability of the program to future targeted DSM/T&D deferral efforts as well as focusing on the connected load on the adverse peak day. PG&E discovered that the AC load was very homogeneous at the local level and coincided with the local area peak. The new focus centered on DSM measures that were applicable on a commercial basis. In addition, the shell improvement measures were dropped as they were found not to be cost effective for reducing the local area peak demand.[R#5]

Following this mid-stream reevaluation of the AC duct repair component, it became clear that little peak load reduction was being provided. Duct repairs were not having much impact because temperatures in the area were extremely high and in the absence of end-use load diversity, minimal peak demand savings were being achieved through this component. Because reduction of local peak demand was the focus of the program, the RACER component developed into the cornerstone of the residential retrofit effort in 1992. ☞

Compact fluorescents, water heater blankets, and efficient showerheads were still installed and blower door tests were still performed. However, the program emphasis was placed on the air conditioning load (through the RACER component) with AC replacements and downsizing recommended. From a distribution planner's perspective, the problem was not the AC units' cycling behavior, but that they were all turned on full speed at the same time of day. One way to reduce the local area peak was to replace existing units with "correctly-sized" units that require less electricity at maximum settings. A total of 492 units were downsized through the program. Customer contributions for the RACER component varied greatly as they were calculated using a complex matrix developed by the utility, based on the replaced unit's age, size, amount of tonnage reduction proposed, and prior SEER. Some customers had all project costs covered by PG&E while others paid up to $1,000.[R#5,9]

RACER program measures included air pressurization testing followed by duct repair, downsizing the AC tonnage based on approved heat gain calculations and replacing the existing unit with an energy-efficient one. Another tactic involved downsizing the AC tonnage in cases where prior installations had resulted in clearly oversized units. A combination of these measures was projected to provide persistent reductions in the area-specific peak load.[R#5]

RESIDENTIAL NEW CONSTRUCTION

With residential new construction, PG&E initially projected that the Antioch/Brentwood area's annual rate of 1,200 housing starts would continue. Instead about 600 housing starts took place annually in large part due to the statewide recession. PG&E believed that significant savings could be achieved in this sector through improvements in the building shell, cooling technology, and solar gain house orientation.[R#5,9]

The marketing strategy focused on increasing the local developer contact efforts associated with PG&E's California Comfort Home program. This program pays incentives to builders who reduce estimated cooling requirements of new homes by 10% or more based on current California Title 24 standards. Typical measures include AC efficiency upgrades, increased ceiling insulation, and increased wall insulation as well as installation of low E, double pane windows. The Diablo Division new construction representative was moved to the MEC Brentwood office and worked closely with the developers active in the Delta area. The enhanced program measures were offered only for those new developments identified as being within the MEC's geographic boundaries. These improvements were pursued through the Enhanced California Comfort Home program. Due to limited response these enhancements were dropped in 1992.[R#5,9]

SMALL COMMERCIAL RETROFIT

In the small commercial sector there were 2,500 accounts which made up 11% of the area-specific peak load. A direct install program promoted through door-to-door marketing was designed focusing on lighting, HVAC, and refrigeration measures.

A contractor who had performed some of PG&E's prior small commercial direct installation pilots was retained to pursue this program component. The contractor's marketing approach centered on visiting areas with high concentrations of small commercial establishments on customer "prenotified" days.[R#5]

Following the completion of a detailed energy audit, the potential participant would review the proposed measures and payback periods. The direct install contractor was responsible for arranging all measure installations. PG&E's financial contribution averaged 84% of the project cost.[R#5]

MEDIUM / LARGE COMMERCIAL RETROFIT

In the medium/large commercial sector there were approximately 140 accounts representing 10% of local area peak load. The MEC program's implementation contractor focused on individual evaluations and retrofits of each customer with an emphasis on lighting, HVAC, and motors.[R#5]

Each of these larger accounts has an assigned PG&E division level account representative who was involved (to the extent desired) in the customer/contractor interactions. Therefore, the marketing approach for this segment varied from the other MEC components.[R#5]

PG&E negotiated a tiered, performance-based contract with a well-known DSM engineering consultant firm. During on-site audits at the various customer facilities, this contractor found the greatest interest from institutional customers such as school districts. Prior to approaching these customers, the engineering contractor would notify the assigned division marketing representative, who would in turn coordinate the on-site audit with the customer. Incentives varied by customer and measure as these were customized applications.[R#5,9]

CURRENT MEC STATUS

In August 1992, PG&E's Diablo Division notified the appropriate corporate entities that the Division would defer consideration of additional substation level transformer bank capacity in the Delta District from 1994 to 1995 at a minimum. This deferral was based on several factors. First, the number of new housing starts remained sluggish due to the recession. Second, a MEC sponsored weather normalization methodology improved the distribution planners' risk assessment relative to the traditional forecasting approach. Third, projected local area peak demand reductions due to the MEC program's implementation were estimated to total 3.8 MW at the time. While this level of savings was not as high as expected, combined with the other two factors it resulted in substation deferral. This deferral was reviewed again in the fourth quarter of 1993 and it was determined that the deferral could be extended.[R#5,9]

Having achieved a one to two-year deferral of the proposed substation and having completed many of the production demonstration pilot implementation goals (i.e., to build, test, and refine program components and administrative systems that can be utilized in subsequent targeted DSM projects), the decision was made to conclude the MEC program implementation phase. On April 6, 1993 the Brentwood MEC office was closed and ongoing customer contact responsibilities for the MEC program components were transferred to PG&E Diablo Division locations.[R#5]

The decision to phase out the MEC program implementation was based on several factors. First, the RACER participation levels achieved were adequate for evaluating load impacts. Second, the systems for each program component had been developed and tested at the production level. Third, it was announced that the Los Vaqueros Reservoir pumping station would be adding a 10 MW block load to the MEC service area. This additional load would mask any remaining local peak impacts from the program on Lone Tree substation deferral. As soon as this 10 MW load commitment was announced, contingency planning to halt program implementation began.[R#5]

MEASURES INSTALLED

With the residential retrofit component, in addition to the in-home energy survey, installed measures included compact fluorescent bulbs, low-flow shower heads, building shell improvements, duct repair, air conditioning tune-up, insulation, and sunscreens. With RACER the same services were still provided but the emphasis was shifted to downsizing existing central AC units. In the small commercial sector 328 customers received installation, and there were 35 participants in the medium commercial sector. No installations were completed in the large commercial sector because these customers had already been heavily marketed in terms of PG&E's system programs. With the residential new construction arena, 318 units were completed.[R#11]

STAFFING REQUIREMENTS

In April of 1992 the MEC program reached its high point in terms of staffing levels. At that time there were 37 full-time equivalents (FTEs) devoted to the program as well as 9 subcontracted installation crews for the residential retrofit market. There were 3 people on each installation crew with a floater who moved from crew to crew. Thus at the height of the project, some 65 full-time equivalents were involved. Key players in the program included Project Manager Robert Kinert, Program Services Manager Greydon Hicks, and General Office Project Consultant Daniel Engel. Additional key staff included a communications manager, an evaluation and quality control specialist, a contract administrator, a new construction program specialist, a residential audit supervisor, a small commercial audit field supervisor, a large commercial audit specialist, and a residential direct installation contractor. In total, there were approximately 55 people staffing the Brentwood project center.[R#9]

In addition, there was a position open during program implementation for a capacity planner that could not be filled. The purpose of this position was to act as a liaison between the DSM implementation team and PG&E's distribution planning community. While not quantifiable, the staff felt that not being able to fill this position was a significant strike against meeting the distribution planning community's needs.[R#9] ■

MONITORING

Upon completing work at any participating home, contractors returned data forms to PG&E which were entered into a comprehensive data base and checked by an engineering consultant. This expert determined which participating houses had complied with the projected shell and duct infiltration levels, which required further work, and which needed further investigation. To guarantee accuracy, 20% of the completed homes were inspected in the field to ensure that the repairs were durable and that the numbers on the forms represented the true final condition of the house. This process ensured that homes requiring additional work were returned to the contractor for completion.[R#6]

When houses passed review and inspection they were flagged in the database. On an as needed basis, an Immediate Impact Management (IIM) tracking report was generated (typically once a month). Based on the parametric information gathered at the home, as well as the past energy use information from billing data, a projection of energy savings and peak reduction was determined. This was accomplished with a proprietary system of empirically-weighted models, and the information was aggregated into the IIM report.[R#6]

The IIM report provided essential management information to the utility. Each report included a graph that compared program savings to the savings that should be achievable within the parameters of the program. This graphic device made it easy to determine when some correction had to be applied to the system. In addition, the report showed the most recent performance of every contractor and crew in the program. It also reported on energy, peak, and emissions impacts and projected current trends to program completion.[R#6]

PG&E staff also had weekly staff meetings with the firms responsible for implementing all program components. These meetings focused on the implementation status of the direct install components as well as the other program delivery efforts.[R#9]

In addition, monthly management reports were initially provided to the General Office and Division Management; eventually these reports were provided on a quarterly basis. Staff also produced annual reports for management review.[R#9]

EVALUATION

MEC Program implementation followed more than two years of planning when PG&E decided to test the least-cost planning hypotheses contained in the PG&E/EPRI planning study, "Targeting DSM for T&D Benefits: PG&E's Delta District (EPRI TR-100487)." This report outlines the planning methodology upon which the MEC program was developed. The report was produced before implementation of the program began and as a result all the figures in the report are based on engineering assumptions and historical data.[R#10]

Preliminary 1993 MEC Evaluation Findings were completed in December 1993, and the "Final MEC Evaluation Report (1991 - 1993)" is due to be completed in June 1994. [R#5]

The "MEC Summary of Lessons Learned" report from September 1993 found that 71% of MEC program participants found the quality of work performed to be "excellent" or "very good," 21% found the quality of work to be "good," 3% found the work fair, 2% responded "don't know," and only 3% found the work poor or very poor. [R#5]

The "Model Energy Communities Program 1993 Residential Load Impact Evaluation" was completed on January 12, 1994. This report found that the each of the new air conditioners installed under the RACER component of the program accounted for 2.20 kW of local area peak demand reductions. Sources for this report include: the participant tracking system databases; PG&E billing data; program specific whole house load data from which modeled five minute energy usage projections are made for participant and nonparticipant air conditioners; and survey data collected from participants and nonparticipants. [R#9,14] ■

COSTS OVERVIEW (1991-1993)	PROGRAM EXPENDITURES (x1000)	COST PER PARTICIPANT
Residential Energy Savings Plan (ESP)	$957.0	$262.34
Residential Shell and Duct Repair	$3,573.2	$1,555.58
Residential AC Early Replacement (RACER)	$920.4	$1,870.82
Residential New Construction (RNC)	NA	NA
Small Commercial Retrofit	$1,255.1	$3,826.51
Medium Commercial Retrofit	$635.4	$18,153.97
Administration	$887.3	NA
Evaluation	$669.7	NA
Total	$8,898.2	

DATA ALERT: Dollar figures have been levelized to $1990, based on $1992, due to the fact that the bulk of program costs were borne in 1992. [R#9]

Costs for the MEC program totaled $8,898,167 from 1991 through 1993. Program costs are not broken out on an annual basis because the program was only implemented for 5 months in 1991 and 3 months in 1993. [R#5,9]

COST EFFECTIVENESS

The cost per kW of local peak demand reduction was greater than expected for some of the residential retrofit measures for two reasons. First, the very rapid program start-up meant that there was no time for a competitive bidding process, and contractors often had to increase their staffs and/or pay for substantial amounts of overtime. Second, the decision to open a fully-staffed local project office, in order to establish a local presence and maximize participation, added significant overhead. [R#5]

In terms of $/kW costs (based on actual costs divided by actual savings), residential shell and duct repairs cost $16,168/kW, the RACER component totaled $916/kW, the Small Commercial Retrofit Component cost $2,202/kW and the Medium Commercial Retrofit ran $1,713/kW. The average $/kW figure for the program as a whole is $3,862/kW. It is however, important to note that based on projected costs and projected kW impacts prior to implementation, PG&E believed the program could be implemented on a cost-effective basis.[R#5,9]

While PG&E will implement additional transmission and distribution deferral projects in the future, the utility emphasizes that the specific administrative structure utilized for the MEC program will not be used as a viable model. Instead the utility believes the value of the MEC program lies in the many diverse lessons learned.[R#9]

COST PER PARTICIPANT

In terms of average utility cost per participant over the course of the program, the Residential Energy Savings Plan component came in at $262, Residential Shell and Duct Repair cost $1,556, the RACER component cost $1,871 per participant, Small Commercial Retrofits cost $3,827 per participant, and Medium Commercial Retrofits cost $18,154 per participant.[R#4,5,9]

COST COMPONENTS

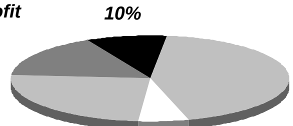
From 1991 through 1993 program expenditures totaled $8,898,167. The Residential Shell and Duct Repair component accounted for the largest portion of expenditures costing $3,573,200. Expenditures for the Small Commercial Retrofit component totaled $1,255,100, the Residential Energy Savings Plan cost $957,000, the RACER component cost $920,400, and the Medium Commercial Retrofit cost $635,400. MEC administrative costs were $887,300, while evaluation costs were $669,700.[R#5,9] ■

Program Savings

SAVINGS OVERVIEW (1991-1993)	ANNUAL ENERGY SAVINGS(MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	ACTUAL ADVERSE PEAK DAY SAVINGS (kW)	ORIGINAL PROJECTED PEAK DAY SAVINGS (kW)
Residential Energy Savings Plan	720	14,400	0	730
Residential Shell and Duct Repair	30	600	221	1,785
Residential AC Early Replacement	176	3,520	1,005	408
Residential New Construction	140	2,800	137	878
Small Commercial Retrofit	1,830	36,600	570	1,017
Medium Commercial Retrofit	1,426	28,520	371	2,000
Total	4,322	86,440	2,304	6,818

DATA ALERT: Program energy savings have been weather normalized based on a typical meteorological year. Peak kW savings are reported as "actual adverse" peak day savings, with adverse peak days defined as summer weekdays exceeding 105° F.

The MEC program produced a total of 2.30 MW of local area-specific actual adverse peak day savings while also reducing annual energy consumption by 4,322 MWh. All savings and participation figures cover the period from 1991 through 1993. Figures are not broken out on an annual basis because the program only ran for five months in 1991 and three months in 1993.[R#5,9]



While the small commercial retrofit and medium commercial retrofit components provided the greatest energy savings (with 42% and 32% respectively), the RACER component which provided 4% of the energy savings, provided fully 43% of the capacity savings, the program's primary focus. Following the RACER component in terms of actual adverse peak day savings were the small commercial component (25%) and the medium commercial component (16%).

PARTICIPATION RATES

There are several types of participants within the MEC program and considerable overlap between residential retrofit participants. In the existing residential sector, 3,648 customers participated in the Energy Savings Plan component, 2,297 customers received shell and duct repairs, and a total of 492 homes participated in the RACER component. A total of 328 small commercial retrofits and 35 medium commercial retrofits were performed, while there were 318 participants in the Residential New Construction component.[R#5,9]

Initially the RACER program downsized 80 AC units at no charge to customers, to make sure that customer satisfaction levels with the downsized units were acceptable. Once this phase was completed, PG&E was pleased to find that customers were willing to pay various amounts for downsized units. The accompanying table reflects the number of replacement offers made by PG&E compared to offers accepted, based on the level of customer contribution. Interestingly, customers required to pay $100 to $300 had a 97% participation rate, while customers required to pay from $1 to $100 had an 80% participation rate.[R#9]

The Medium Commercial Retrofit component achieved the greatest adverse peak day savings per participant with 10.60 kW/participant. Savings per participant for the RACER component totaled 2.04 kW, while the Small Commercial Retrofit component came in at 1.74 kW per participant. Residential New Construction savings totaled 0.43 kW per participant, and Residential Shell and Duct Repair had savings of 0.1 kW per participant.[R#9]

PROGRAM PARTICIPATION (1991 - 1993)	NUMBER OF PARTICIPANTS	PEAK DAY SAVINGS PER PARTICIPANT (kW)
Residential Energy Savings Plan (ESP)	3,648	0.00
Residential Shell and Duct Repair	2,297	0.10
Residential AC Early Replacement (RACER)	492	2.04
Residential New Construction (RNC)	318	0.43
Small Commercial Retrofit	328	1.74
Medium Commercial Retrofit	35	10.60

FREE RIDERSHIP

For almost all services provided by the MEC program no level of free ridership was assigned, due to the fact the RACER, residential retrofit, shell and duct repair, and commercial program components were all direct install oriented.[R#9]

MEASURE LIFETIME

For research purposes PG&E ramped up and replicated program delivery to equate to an average measure lifetime of twenty years for the MEC program. This 20-year figure represents PG&E's planning horizon for long-term capital expansion plans, and thus was used in an attempt to establish a level playing field between demand-side and supply-side options for cost effectiveness from a distribution planning perspective.[R#9]

For program components having a lifetime less than 20 years, program costs were adjusted upwards accordingly. For example, say lighting retrofits were assigned a 7-year lifetime. In order to match the 20-year lifetime, program savings and costs would be multiplied by approximately three. Thus every program component was adjusted in terms of savings and costs as if it had a 20-year lifetime. Note however, that the savings and cost figures presented in this profile reflect actual achievements.[R#9,10]

The actual measure lifetimes used by PG&E matched the measure life used for system-wide DSM programs, including 18 years for AC, 20 years for shell and duct repair, 10 years for light bulbs, and 18 years for ballasts.[R#9] ■

RACER PARTICIPATION BY LEVEL OF CUSTOMER CONTRIBUTION						
Year of Initial AC Installation	$1 - $99	$100 - $299	$300 - $499	$500 - $999	$1,000	Total
Pre 1982 Offers	49	10	44	95	5	203
Offers Accepted	46	10	39	52	1	148
1982 - 1986 Offers	23	20	6	82	2	133
Offers Accepted	20	20	6	33	1	80
1987+ Offers	178	1	111	73	1	364
Offers Accepted	135	0	36	13	0	184
Total Offers	250	31	161	250	8	700
Offers Accepted	201	30	81	98	2	412

Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON: 4,322,000 kWh saved 1991 - 1993

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
COAL:	**Uncontrolled Emissions**					
A	9,400	2.50%	9,318,000	221,000	45,000	4,000
B	10,000	1.20%	9,936,000	86,000	29,000	21,000
	Controlled Emissions					
A	9,400	2.50%	9,318,000	22,000	45,000	0
B	10,000	1.20%	9,936,000	9,000	29,000	1,000
C	10,000		9,936,000	57,000	29,000	1,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	9,936,000	26,000	14,000	7,000
B	9,400	2.50%	9,318,000	22,000	18,000	1,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	9,936,000	18,000	3,000	7,000
B	9,010		8,938,000	6,000	2,000	0
GAS:	**Steam**					
A	10,400		5,420,000	0	12,000	0
B	9,224		4,707,000	0	29,000	1,000
	Combined Cycle					
1. Existing	9,000		4,707,000	0	18,000	0
2. NSPS*	9,000		4,707,000	0	9,000	0
3. BACT*	9,000		4,707,000	0	1,000	0
OIL:	**Steam--#6 Oil**					
A	9,840	2.00%	7,844,000	119,000	14,000	13,000
B	10,400	2.20%	8,320,000	118,000	18,000	9,000
C	10,400	1.00%	8,320,000	17,000	14,000	4,000
D	10,400	0.50%	8,320,000	49,000	18,000	3,000
	Combustion Turbine-#2 Diesel					
A	13,600	0.30%	10,412,000	21,000	32,000	2,000
REFUSE DERIVED FUEL:	**Conventioa\nal**					
A	15,000	0.20%	12,361,000	32,000	42,000	9,000

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the accomanying page is to allow any user of this profile to apply Pacific Gas and Electric's level of avoided emissions saved through its Model Energy Communities Program to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources. ■

*** Acronyms used in the table**

TSP = Total Suspended Particulates
NSPS = New Source Performance Standards
BACT = Best Available Control Technology

LESSONS LEARNED

Despite the fact that MEC's original intent was only partially fulfilled, there were many invaluable lessons learned from the Delta Project. As with most initial groundbreaking pilots, much of the value is derived from trying and learning. One key lesson learned is that the success of targeted DSM programs depends heavily on a combination of factors, including unique characteristics (social, demographic etc.) of the targeted service area.

Therefore, instead of judging the MEC program solely on its role in substation deferral, PG&E prefers to focus on the value of the many lessons learned, looking very closely at the components of the program that are transferable to other distribution areas and other PG&E DSM programs. These lessons will assist other utilities keen on applying this approach to their own transmission and distribution bottlenecks. Thanks to PG&E, MEC is well documented and reflects the utility's and staff's commitment to research in this important area of localized least cost resource planning.[R#5,7,9]

The Lone Tree substation was effectively deferred until at least 1995, but the MEC program and its load impacts were only one factor contributing to this deferral. Other factors included the economic recession as well as changes in weather normalization methodologies used by distribution planners. These unanticipated factors had a significant effect and underscore the complex nature of compound effects that drive the need, or lack thereof, for capital additions.[R#5,7,9]

Allow sufficient time for design and preparation: With sufficient utility management support, PG&E believes that it is possible to design and implement an aggressive targeted distribution deferral DSM effort in six months. However, such rapid implementation has a price. There is a trade-off between implementing a program as quickly as possible and allowing sufficient time to fully institute management control mechanisms such as contractor bidding, quality assurance, and budget tracking.[R#5]

In terms of timing, PG&E recommends selecting a targeted T&D area where the window of opportunity (i.e., capital investment decision point) is approximately 3-4 years out in time. Similarly, it is important to focus program design on technologies that are well developed, commercially viable, readily available in terms of timing and quantity, and priced reasonably to allow for straightforward, quick implementation.[R#5,7]

Identify the limits of shell repair impact on local area peak: The shell and duct repair component of the MEC program provided substantive conservation benefits as well as diversified system-level peak demand savings. However, PG&E discovered that local peak demand reduction from shell and duct repair measures was minimal and therefore not cost effective. The utility concluded that the problems were the result of two factors. First, PG&E had to pay for the development of a duct repair contractor infrastructure. Second, the impact of duct repair measures on the local area peak load is limited by the degree of coincidence of the local area peak with AC use. In the case of the Delta area, that meant an extremely high level of coincidence on adverse peak days. These limiting factors led PG&E to conclude that duct repair could not reduce the connected load of the existing AC unit, but only its cycling behavior.[R#5]

The compilation by PG&E of the site specific AC load shape data and the local area peaking load revealed that the AC load is very homogeneous at the local level. This coincidence of homogeneous local AC load with local peak load has been one of the most important lessons learned by PG&E from the MEC program. This lesson allowed the project team to refine the program design by 1) focusing on the local peaking operating criteria of the customers' loads, through 2) reducing the customers' connected load. Addressing only one or the other of these program design elements is of little value from a distribution system reliability standpoint. In addition, addressing both of these issues is necessary in order to allow PG&E to target high value AC oriented programs only to those customers who can best benefit from them, while also providing maximum value to the company.[R#5]

There are certainly system wide peak demand and energy benefits associated with shell improvement measures. However, at the local level the peak demand impacts disappear from a distribution planner's perspective, leaving only conservation benefits. Local peak savings did not correlate with the system wide peak because the system peak not only occurred at a different time from the local peak, but system peak demand savings were relatively irrelevant from the local distribution planner's perspective.[R#5]

Incorporate the DSM review process into PG&E's annual capital expansion planning process: The designers of the MEC program initially projected achieving up to six years of substation capital deferral. This projection was made from a DSM potential standpoint and did not take into account that PG&E reviews its distribution planning capital expansion options annually. PG&E now realizes that it is better to ask the involved distribution planner whether they are comfortable delaying a targeted capital expansion for one more year as opposed to six. Doing so tends to increase the distribution planner's confidence in risk assessment as only an incremental deferral is required at any specific point.[R#5]

Because DSM evaluators and local distribution plannners tend to look at program results from different perspectives, it is vital to create a level playing field of "success criteria" that is acceptable to both DSM evaluators and the local distribution planner(s). As the program progresses it is essential to confirm that the planner's success criteria have not changed.[R#7]

Keep communications open and ongoing between utility resource planners and the DSM implementation groups: When PG&E's DSM group was planning the MEC program, they were under the impression from the corporate resource planners that there was a slight chance that the Los Vaqueros pumping station load would be added to the MEC targeted area. After assessing this and other potential added load risks, the DSM group proceeded with the MEC project. At this point communications between program implementers and PG&E's local distribution planners declined, due in large part to the fact that the capacity planner position for this program was not filled. It is important to note however, that due to a combination of several previously discussed factors, PG&E was already planning on ending the MEC program within a few months when notified of plans for the 10 MW load. If PG&E had been planning to continue the program, the Los Vaqueros load would have signaled the appropriate reevaluation of continued implementation. Thus a key lesson learned is to keep communications frequent and ongoing between the DSM implementation team and the distribution planners in order to best target markets for similar projects which are unlikely to have large loads added in the near future.[R#9]

Design and develop a targeted participant database: In order to conduct a sophisticated targeted marketing campaign, PG&E believes it is imperative to maintain a potential population database including participants. To ensure that the database would be responsive to the needs of the project team, the MEC team developed a stand-alone PC-based participant database rather than depend upon the utility's system-wide Customer Information System (CIS). This CIS system was designed to manage a limited amount of data for each of a large number of accounts, while the MEC program needed a great deal of data for each of a limited number of customers.

Implementation: The utility found that by opening a MEC office in the Brentwood area staffed by PG&E employees who had accepted "rotational assignments," many advantages were created including ease of communication among local involved parties, quick response to changes in program marketing, implementation, and customer site visit scheduling, as well as proximity of staff in terms of administration. The program also required a substantial investment of staff resources at the corporate level as well. The benefits from the local office and corporate presence came at a rather substantial cost in terms of administrative overhead. All of this overhead was assigned directly to the MEC implementation efforts, which affected the benefit-to-cost ratios significantly. In pursuing subsequent targeted DSM projects, PG&E intends to consider performance-based implementation contracting (as attempted with the small and medium contracts) as an alternative to staffing a local PG&E project office.[R#5]

Test the program on residents who are utility employees: The first "beta test" participants in the MEC program were current PG&E employees or retirees, who provided very frank feedback on the program. These comments were taken into account before the program was offered to other customers. This approach also increased the work crew's confidence in providing services and answering program questions. The PG&E employees were also used as word of mouth marketers for the program once it was up and running.

Evaluation: PG&E believes the MEC program evaluation to date has demonstrated two key ways that evaluation activities can increase the benefits of a localized DSM program. First, the MEC evaluation activities were incorporated into the decision-making framework by which a specific distribution capital enhancement would be evaluated and possibly deferred. Second, the dynamic nature of the MEC implementation required that evaluation results ☞

be used in mid-course (what PG&E terms "up-periscope" evaluations) to enhance or change the program as it progressed.[R#5]

One challenge of the MEC evaluation was to merge the traditional decision making framework for evaluating a specific distribution capital project with the more transactional orientation of typical DSM efforts. Therefore it was necessary to demonstrate a reduction in demand not only at the time of the local area peak, but at the time of the local area "adverse peak."[R#5]

While implementing the MEC evaluation, there were several opportunities to use interim evaluation results to help shift the design and implementation of the various program components. One key example is the initial evaluation of the Duct Repair program component. After realizing that this program would not meet initial expectations relative to the adverse peak day criterion, the staff redesigned the program so that it became the springboard for the more reliable RACER pilot.[R#5]

Putting targeted T&D deferral in perspective: Initial utility projections were that targeted DSM would have widespread applicability throughout PG&E's 201 distribution planning areas as a capital deferral option. These projections have been tempered. The MEC program has shown that full-blown targeted DSM implementation can be a viable option in a subset of specific market applications.

Real-Time evaluation leads to course change capability: Throughout the program's implementation, the MEC staff worked to identify the discrepancies between cost and impact and then refocus the project's direction and emphasis. For example, when it became clear that the AC duct repair alone would not contribute substantive local area peak demand savings (due to the operating coincidence of AC units during summer heat storms which drive the local peak and the units' connected load) the staff developed a residential AC early replacement and downsizing component. Similarly, as the MEC staff monitored the various shell integrity measures initially implemented, it became clear that they would fail to reduce the AC connected load. This realization stripped the measures of their local peak impact benefit, resulting in their being found not cost effective and being dropped from the MEC menu due to the fact that marginal costs associated with diversified generation level impacts were slim.[R#5]

CEE does not equal load management: The MEC program was funded entirely from PG&E's Conservation/Energy Efficiency (CEE) budget, which is separate from the load management budget. CEE programs generally focus on energy savings. Because of the funding source, the program did not examine or implement any load management measures. In retrospect PG&E believes it could have addressed local area peak much better through load management (i.e., cycling) programs. For future T&D deferral programs, PG&E is definitely planning on using load management as one of the primary means to defer additional T&D requirements.[R#9]

TRANSFERABILITY

TRANSFERABILITY TO FUTURE TARGETED DSM/T&D PROJECT DEFERRALS

One focus of the MEC program was to build, test, and refine program components and administrative systems that can be utilized routinely in future targeted DSM/T&D project deferrals. Such transferability can help justify the high developmental costs associated with creating these types of pilots. In the MEC program, the primary components were designed for 1,000 to 3,000 participants. The MEC project team wanted to explore the fine balance between targeting services to specific customer market niches and at the same time ensuring that the implementation of the given program measure has sufficient "cookie cutter" aspects to permit a fairly rapid and predictable implementation schedule.[R#5]

Prior to pursuing MEC, the utility's expectation was that deferring distribution capital with DSM was a concept with potentially widespread applications. The MEC efforts showed that several criteria need to be met in order for targeted DSM to realistically defer distribution capital expenses. Rather than being applicable in most of PG&E's distribution planning areas, targeted DSM is now viewed as being appropriate in a subset of PG&E's distribution planning areas. The utility believes there is still value in pursuing targeted DSM distribution capital expenditure deferral opportunities. However, it is important to more realistically frame its potential impact on the capital funding requirements and asset utilization goals within the targeted distribution planning areas.[R#5]

When considering the remaining 200 PG&E distribution planning areas (DPAs), the MEC experience has allowed PG&E to develop a list of project selection criteria that can be used to identify those high value/success factor locations for subsequent implementation efforts. These criteria include: the decision point for the proposed distribution capital expansion is three to four years in the future, the candidate DPA is a high value location in terms of local area marginal costs, the customer group in the DPA is diverse, with various end uses contributing to the "adverse day" local area peak demand, support from the local division (distribution planners) is evident, and what block loads are projected to come on line (and when) within the candidate planning area.[R#5]

TRANSFERABILITY TO OTHER PG&E DSM PROGRAMS

The experience gained from the MEC program will be incorporated by PG&E into future DSM programs. The experience gained through this program has already contributed to program design enhancements for PG&E's Residential New Construction program, including incentives for developers to consider duct repair as an energy conservation option and promote duct blasting technologies for testing duct integrity. Based on the infrastructure developed in support of duct repair methodologies, PG&E's Energy Partners program (see Profile #75) now incorporates duct repair into its low-income residential weatherization measures. In addition, target marketing techniques have been improved based on the MEC pilot program marketing experience. PG&E is also considering the use of area-specific direct load control operations by local Division Electric Operations offices.[R#5]

TRANSFERABILITY TO OTHER UTILITIES

Through EPRI sponsored Targeted DSM/T&D Deferral workshops and scheduled tutorials, other California utilities are benefitting from the experience gained from the MEC program, hopefully allowing them to avoid some of the more difficult lessons learned by PG&E.[R#5]

PG&E believes it is important that similar pilot programs focus on "production demonstration" tests. That is, the goal of subsequent pilots should be not only to prove the DSM deferral concept in one given environment, but also to build, test, and refine program components and administrative systems that can be utilized in subsequent targeted DSM/T&D deferral projects.[R#5]

While many utilities are currently studying how to implement targeted DSM/T&D deferral projects, there are a limited number of utilities actually implementing similar projects. Alberta Power has implemented the Jasper Energy Efficiency project (JEEP), Central Maine Power has implemented the Wells-Ogunquit project, and Southeast Queensland Electricity Board in Australia runs the Gold Coast project. Other recently implemented projects include the Beaudesert Branch project in Australia, the Holyhead Power Savers project in the United Kingdom, and a Seattle City Light project.[R#9]

The JEEP project began in Jasper, Alberta by reducing peak demand in the residential sector by 500 kW and now focuses on the commercial sector. In the residential sector, four local residents were hired to go door-to-door offering energy efficiency tips and promoting energy-efficient products including CFLs, timers, power saver cords, and water heating conversions. The program has a goal of saving 1,500 kW in the commercial sector, providing audits and incentives of up to $450 per peak kW. By pursuing these projects, Alberta Power hopes to defer the need to build a transmission line linking the town to the provincial grid.[R#9]

The Wells-Ogunquit project was unique in that instead of trying to defer the need for additional T&D lines like PG&E, CMP planned to install additional T&D lines as soon as possible, but realized that due to regulatory constraints this would take some time. The Wells-Ogunquit area is a summer resort town whose popularity has grown immensely in recent years, creating capacity problems. Until the needed T&D lines could be added, CMP implemented conservation programs in the area in the hopes of reducing peak demand.[R#15]

Gil Peach, a noted expert on community-based programs, believes that although each community based program is unique (regardless of its focus, be it energy savings or T&D deferral), there is a lineage from project to project. Peach considers the MEC program the targeted T&D prototype, and believes it was used as a model for the Holyhead Power Savers project, which was in turn used as a model for the Gold Coast project, which was followed by the Beaudesert Branch project. This progression underscores the value of PG&E's research in this area as being ripe with potential for demand-side management, and points to the need for subsequent projects to maintain rigorous monitoring and evaluation such that the results can be used to refine such programs in the future. [R#16] ■

Regulatory Treatment

The purpose of this section is to discuss the regulatory treatment of the costs of Pacific Gas & Electric's Model Energy Communities program. To do so, a brief review of the regulatory treatment of all PG&E's DSM programs is presented to illustrate the overall regulatory context within which PG&E operates its DSM programs. Following this abbreviated overview, the specific regulatory treatment of the Model Energy Communities program is presented. More comprehensive discussions of the regulatory treatment of California's utilities regarding DSM, and specific treatment of PG&E's programs, can be found in Profiles #4, 14, 25, 33, & 75.

UTILITY REGULATORY OVERVIEW

Since 1990 Pacific Gas & Electric has been eligible to receive earnings by successfully implementing energy conservation programs thanks to the California Collaborative. The California Collaborative built on the state's precedent-setting 1982 Electric Revenue Adjustment Mechanism (ERAM) which decoupled sales and utility profits and effectively removed the disincentive for utilities to invest in their customers' energy efficiency. The Collaborative pushed beyond removing the disincentives to DSM and created a situation in which utilities are allowed additional incentives for their successes with demand-side management.

For the purpose of determining shareholder incentives, PG&E has three types of DSM programs: Resource, Equity, and Demonstration. Each of these is eligible for a different level of shareholder incentives. Resource programs, whereby the utility directly buys energy resources from its customers and which include most of PG&E's core incentive programs, are eligible for shareholder incentive treatment. Equity programs, including educational efforts, are also eligible for shareholder incentives although to a lesser degree than Resource programs. Demonstration programs are by definition not yet proven resource alternatives and are thus not eligible for shareholder incentives. Note that PG&E's Research and Development Department also uses funds for DSM, such as the ACT2 Project, which are not eligible for incentives. Like the demonstration programs, R&D initiatives are expensed in the current year.

PROGRAM-SPECIFIC INFORMATION

The Model Energy Communities program is considered a DSM demonstration program. As such its costs were expensed in the current years that the program was implemented. No shareholder incentives have been received for the program. Now that the concept has been proven, however, subsequent efforts may or may not be considered Resource programs and as such may be eligible for shareholder incentives in the future. ■

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